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		DB=PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD; PLUR=YES; OP=ADJ	
☐	L15	L14 and (sanit$ or disinfect$)	21
☐	L14	(uv or ultraviolet$) with (without with wash$)	198
		DB=USPT; PLUR=YES; OP=ADJ	
☐	L13	L12 and conveyor and (uv or ultraviolet$)	4
☐	L12	(5744094 or 6094887 or 3817703 or 3941670 or 4313767 or 4883542 or 5265298 or 6066081 or 5326542 or 5809739 or 5579787 or 5211825 or 5183513 or 5810037 or 5839419 or 5879643 or 6209705 or 6080435).pn.	18
		DB=PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD; PLUR=YES; OP=ADJ	
☐	L11	134/25.2.ccls. and (uv or ultraviolet$)	17
		DB=USPT; PLUR=YES; OP=ADJ	
☐	L10	L9 with container	3
☐	L9	rpc	2373
☐	L8	134/$.ccls. and conveyor and (uv or ultraviolet$)	84
☐	L7	l6 and conveyor and (uv or ultraviolet$)	0
☐	L6	134/1.ccls. and (134/25.1.ccls. or 134/25.2.ccls.)	30
☐	L5	l3 and 422/24.ccls.	39
☐	L4	L3 and container	618
☐	L3	(wash$ or sterilis$ or disinfect$) and conveyor and (uv or ultraviolet$)	1678
		DB=PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD; PLUR=YES; OP=ADJ	
☐	L2	sanitizing and conveyor and (uv or ultraviolet$)	79
		DB=USPT; PLUR=YES; OP=ADJ	
☐	L1	6432147.pn.	1

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L2: Entry 30 of 79 File: PGPB Oct 31, 2002

DOCUMENT-IDENTIFIER: US 20020159917 A1
TITLE: System and method for cleaning, high level disinfection, or sterilization of medical or dental instruments or devices

Detail Description Paragraph:
[0041] The system can be constructed to circulate wash composition around the object with concurrent application of ultrasonic energy. For example, the system can include a sprayer that sprays the object with wash composition while a sonicator applies ultrasonic energy. Alternatively, by way of further example, the system can include an immersion tank, a circulating pump that circulates wash composition within the immersion tank, a sonicator that applies ultrasonic energy to the circulating wash composition, and a conveyor that transports the object into or through the tank. The system can include a water heater or other apparatus to increase the temperature of the wash composition to an elevated temperature.

Detail Description Paragraph:
[0057] In an embodiment, system (1), preferably first station (3), sonicator (5), and liquid transporter (7) are adapted and configured to immerse the object in the wash composition and apply ultrasonic energy to the immersed object. Sonicator (5) can be adapted and configured to provide ultrasonic energy from a point within system (1), to apply ultrasonic energy throughout the wash composition, or both. In configurations in which the object is immersed in a liquid in system (1), particularly first station (3), system (1) or station (3) can take any of a variety of configurations suitable for containing a liquid. For example, system (1) or station (3) can include a tub, a tank, or a bath. In configurations in which the object is immersed in a liquid in system (1), particularly first station (3), liquid transporter (7) can include one or more pumps, drains, and/or valves configured to add liquid to system (1), circulate liquid within system (1) and around the object (including into or through any cavities or lumens), and to drain or remove liquid from system (1). A tub, tank or bath employed in system (1) can include a sump that receives the wash, rinse, or antimicrobial composition, and that also includes a heating coil for heating one or more of these compositions. In configurations in which system (1), particularly first station (3), immerses the object in a liquid, system (1) can include a conveyor, lift, or other apparatus adapted and configured to lower the object or a rack containing the object into the tub, tank, or bath containing the composition.

Detail Description Paragraph:
[0064] System (1) can also include mechanical, analog, or digital control apparatus to start and stop in the appropriate sequence the various

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components of the system, such as liquid transporters (e.g., sprayers or pumps), conveyors, if any, sonicators, and dryers. Such mechanical, analog, or digital control apparatus for cleaning systems is well-known to those of skill in the art. The control apparatus can include systems for determining which of the several sonic, wash, rinse, and antimicrobial cycles to run for a particular object or rack of objects. Such a control apparatus can include a bar code reader that reads a bar code on a rack or object, which details the cycles to run for that rack or object. The control apparatus can also include safety mechanisms linked to one or more doors of system (1) that prevent system (1) from running unless the doors are sealed or closed, or if unauthorized objects are in system (1).

Detail Description Paragraph:
[0065] System (1) can also include a load apparatus or unload apparatus. Load apparatus supports and moves objects or racks containing objects into system (1). Unload apparatus receives racks exiting system (1). The unload apparatus can be coupled to the load apparatus to return racks to the load apparatus, for example, by conveyor. System (1) can also include a conveyor (31), which can move the object or a rack containing the object through system (1). In a manual embodiment, an operator can place the object or a rack containing the object into system (1), and remove it from system (1).

Detail Description Paragraph:
[0067] Emitter (51) can be adapted and configured to impact the object with energy during circulation of the wash composition. For example, emitter (51) can impact the object with light, preferably ultraviolet light, energy from throughout the wash composition. By way of further example, emitter (51) can impact the object with light, preferably ultraviolet light, energy from a point in the chamber or station concurrently with circulation of the wash composition. Emitter can be adapted and configured to impact the object with energy during or after circulation of the antimicrobial composition. Such an emitter (51) can impact the object with, for example, light or microwave energy, preferably in the presence of the antimicrobial composition. For example, emitter (51) can impact the object with light, preferably ultraviolet light, energy from throughout the antimicrobial composition. By way of further example, emitter (51) can impact the object with light, preferably ultraviolet light, energy or microwave energy from a point in the chamber or station after with circulation of the antimicrobial composition.

Detail Description Paragraph:
[0087] A two station embodiment can include an apparatus for moving the object from first station (3) to second station (25). For example, the system can include a conveyor (31) adapted and configured to translocate the object between first and second stations (3 and 25) and/or through system (1). First station (3) and second station (25) can occupy the same or overlapping spaces. For configurations in which first and second stations (3 and 25) occupy the same space, conveyor (31) need not translocate the object from one station to the other. In such a configuration, conveyor (31) can translocate the object in and out of, or through, system (1). For configurations in which first and second stations (3 and 25) occupy overlapping spaces, conveyor (31) can translocate the object from a location preferable for circulating a composition at first station (3) to a position preferably for circulating a composition at second station (25). In a position preferable for circulating a composition at first station (3), a composition circulating at second

station (25) can still contact the object, and vice versa. In this configuration, conveyor (31) can translocate the object in and out of, or through, system (1). First station (3) and second station (25) can occupy distinct spaces, and, in such an embodiment, conveyor (31) can translocate the object from one station to the other. In this configuration, conveyor (31) can translocate the object in and out of, or through, system (1).

Detail Description Paragraph:
[0102] A three station embodiment can include an apparatus for moving the object from first station (3) to second station (25), from second station (25) to third station (33), among any other combination of stations, and/or through system (1). For example, system (1) can include a conveyor (31) adapted and configured to move the object between first, second, and/or third stations (3, 25, and 33), and/or through system (1). The three station embodiments can employ conveyor systems with capabilities and structures analogous to those described hereinabove for two station embodiments. In a manual embodiment, an operator moves the object between first, second, and/or third stations (3, 25, and 33).

Detail Description Paragraph:
[0116] A four station embodiment can include an apparatus for moving the object from first station (3) to second station (25), from second station (25) to third station (33), from third station (33) to fourth station (37), among any other combination of stations, and/or through system (1). For example, system (1) can include a conveyor (31) adapted and configured to move the object between first, second, third, and/or fourth stations (3, 25, 33, and 37), and/or through system (1). The four station embodiments can employ conveyor systems with capabilities and structures analogous to those described hereinabove for two and three station embodiments. In a manual embodiment, an operator moves the object between first, second, third, and/or fourth stations (3, 25, 33, and 37).

Detail Description Paragraph:
[0129] A five station embodiment can include an apparatus for moving the object from first station (3) to second station (25), from second station (25) to third station (33), from third station (33) to fourth station (37), from fourth station (37) to fifth station (43), among any other combination of stations, and/or through system (1). For example, system (1) can include a conveyor (31) adapted and configured to move the object between first, second, third, fourth, and/or fifth stations (3, 25, 33, 37, and 43), and/or through system (1). The five station embodiments can employ conveyor systems with capabilities and structures analogous to those described hereinabove for two, three, and four station embodiments. In a manual embodiment, an operator moves the object between first, second, third, fourth, and/or fifth stations (3, 25, 33, 37, and 43).

Detail Description Paragraph:
[0141] A six station embodiment can include an apparatus for moving the object from first station (3) to second station (25), from second station (25) to third station (33), from third station (33) to fourth station (37), from fourth station (37) to fifth station (43), from fifth station (43) to sixth station (47), among any other combination of stations, and/or through system (1). For example, system (1) can include a conveyor (31) adapted and configured to move the object between first, second, third, fourth, fifth,

and/or sixth stations (3, 25, 33, 37, 43, and 47), and/or through system (1). The six station embodiments can employ conveyor systems with capabilities and structures analogous to those described hereinabove for two, three, four, and five station embodiments. In a manual embodiment, an operator moves the object between first, second, third, fourth, fifth, and/or sixth stations (3, 25, 33, 37, 43, and 47).

Detail Description Paragraph:
[0149] Although a sonicator represents a preferred apparatus for applying energy before and during circulation of wash composition, the system (1) and methods of the present invention can employ sources of energy other than a sonicator and forms of energy other than ultrasonic energy. For example, a variety of types of energy that can be emitted form a point source can be substituted for emitting ultrasonic energy from a point source. Suitable forms of energy that can be emitted from a point source, that can contract an object, and that can aid cleaning of an object include microwave energy, continuous or pulsed light (preferably ultraviolet light) energy, and the like.

Detail Description Paragraph:
[0150] For employing such point energy sources, an emitter (51) can be substituted for sonicator (5) or second sonicator (41) in any of the embodiments described herein above. Emitter (51) can include a point source of microwave energy, a point source of light energy (e.g., ultraviolet light), preferably pulsed light energy, and the like. For example, emitter (51) can include a source of ultraviolet light, such as a mercury arc lamp or a xenon flash lamp. Such lamps can provide either continuous or burst pulsed high energy ultraviolet light. Preferably, emitter (51) includes a source of ultraviolet light in the range of about 180 nm to about 300 nm. Such an emitter can include a quartz window to shield the light source from washing composition or soil.

Detail Description Paragraph:
[0161] Although impacting or contacting with ultrasonic energy represents a preferred embodiment, contacting the object with energy can occur through one or more of several known mechanisms for applying energy to an object. For example, contacting can include applying microwave energy, light energy, or the like, or a combination thereof. For example, applying microwave energy can employ a point source of microwave energy that contacts the object with microwave energy before contact with the wash composition. By way of further example, applying light energy can employ a source of continuous or pulsed light, preferably ultraviolet light, that contacts the object inside or outside the system, and before or during contact with the wash composition. Applying light energy can employ a light source immersed in the wash composition and emitting light energy from a point within the wash composition, preferably a point adjacent the object, or a larger light source or multiple sources that provide illumination throughout the wash composition. Light energy can be applied before contacting the object with the wash composition and within or outside of the chamber employed for washing.

Detail Description Paragraph:
[0170] Treating can include applying energy to the object during or after circulating the antimicrobial composition. Treating can include, for example,

applying light or microwave energy to the object, preferably in the presence of the antimicrobial composition. For example, treating can include applying light, preferably ultraviolet light, energy throughout the antimicrobial composition. By way of further example, treating can include applying light, preferably ultraviolet light, energy or microwave energy after circulating the antimicrobial composition.

Detail Description Paragraph:
[0180] The method can include moving the object from one location to another, or translocating the object, between one or more of contacting, treating, rinsing, and drying. For example, the method can include one or more of translocating the object between contacting and treating, between treating and rinsing, between rinsing and drying. Translocating can also occur between any other processes included in the method. For example, when the method includes contacting the object with ultrasonic energy before contacting with the wash composition, the object can be translocated between the site of contacting with ultrasonic energy of the site of contacting with the wash composition. When the method includes, a first rinsing between contacting and treating and/or a second rinsing between treating and drying, translocating can occur at one or more of between washing and the first rinsing, between the first rinsing and contacting, between treating and the second rinsing, and between the second rinsing and drying. Translocating the object can employ any of several apparatus suitable for moving an object or a rack containing an object from one location to another, such as a conveyor.

Detail Description Paragraph:
[0188] Quaternary ammonium antimicrobial agents are useful in the present invention, due to their commercial availability, easy incorporation into formulas and high sanitizing efficacy. These sanitizing agents are also preferred because of their compatibility to high water temperatures to the presence of high organic loads, stability and broad spectrum antimicrobial efficacy in variable high and low pH wash systems, inherent chemical deodorizing, and their non-staining, non-bleaching, non-corrosive nature. Illustrative quaternary ammonium salts include distearyl dimethyl ammonium chloride, stearyl dimethyl benzyl ammonium chloride, coconut alkyl dimethyl benzyl ammonium chloride, dicoconut alkyl dimethyl ammonium bromide, cetyl pyridinium iodide, and cetyl pyridinium iodide, and cetyl trimethyl ammonium bromide, and the like.

CLAIMS:

29. The system of claim 1, further comprising conveyor adapted and configured to transport the object through the system.

85. The system of claim 84, wherein the emitter comprises source of ultraviolet light adapted and configured to impact the object with ultraviolet light.

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Inventor Name Search Result

Your Search was:

Last Name = ABRAMS
First Name = LORNE

Application#	Patent#	Status	Date Filed	Title	Inventor Name 3
10074111	Not Issued	030	02/11/2002	METHOD AND APPARATUS FOR SANITIZING REUSABLE ARTICLES	ABRAMS, LORNE
07329266	4961670	150	03/27/1989	MOLDED SEPTIC TANK	ABRAMS , LORNE
07075881	D315046	150	07/21/1987	MODULAR WHEEL CHAIR RAMP UNIT	ABRAMS , LORNE

Inventor Search Completed: No Records to Display.

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Inventor Name Search Result

Your Search was:

Last Name = PALMER
First Name = JAY

Application#	Patent#	Status	Date Filed	Title	Inve Nam
60525295	Not Issued	020	11/25/2003	PLATINUM COMPLEXES AND METHODS OF USE	PAL JAY
60515580	Not Issued	020	10/30/2003	METHODS FOR INHIBITING TUMOR CELL PROLIFERATION	PAL JAY
60481226	Not Issued	020	08/13/2003	PLATINUM COMPLEX STAT3 INHIBITORS	PAL JAY
60337924	Not Issued	159	12/06/2001	SLOW-RELEASE (GSSP) FERTILIZER	PAL JAY
60193315	Not Issued	159	03/30/2000	METHOD AND SYSTEM FOR ESTABLISHING ELECTRONIC BUSINESS SYSTEMS FOR SUPPORTING COMMUNICATIONS SERVICES COMMERCE	PAL JAY
60006944	Not Issued	159	11/17/1995	(MONO)ETHYLENEDIAMINE COMPLEXES OF PLATINUM(IV) WITH LIGANDS OF OXIDES OF NITROGEN AS POSSIBLE ANTI-TUMOR AGENTS	PAL JAY
10650315	Not Issued	019	01/01/0001	150W-1000W MASTERCOLOR CEREMIC METAL HALIDE LAMP SERIES WITH COLOR TEMPERATURE ABOUT 4000K, FOR HIGH PRESSURE SODIUM OR QUARTZ METAL HALIDE RETROFIT APPLICATIONS	PAL JAY
10313497	Not Issued	030	12/06/2002	SLOW-RELEASE (GSSP) FERTILIZER	PAL JAY

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10074111	Not Issued	030	02/11/2002	METHOD AND APPARATUS FOR SANITIZING REUSABLE ARTICLES	PAL JAY
09851443	Not Issued	061	05/08/2001	COIL ANTENNA/PROTECTION FOR CERAMIC METAL HALIDE LAMPS	PAL JAY
09850960	Not Issued	120	05/08/2001	150W-1000W MASTERCOLOR CERAMIC METAL HALIDE LAMP SERIES WITH COLOR TEMPERATURE ABOUT 4000K, FOR HIGH PRESSURE SODIUM OR QUARTZ METAL HALIDE RETROFIT APPLICATIONS	PAL JAY
08895746	Not Issued	161	07/17/1997	VARIABLE GEOMETRY FACE FOR GOLF CLUB	PAL JAY
08844914	5942840	150	04/22/1997	HIGH-PRESSURE DISCHARGE LAMP WITH SEALED UV-ENHANCER	PAL JAY
08749264	5849790	150	11/15/1996	(MONO) ETHYLENEDIAMIONENITROPLATINUM (IV) COMPLEXES WITH LIGANDS OF OXIDES OF NITROGEN AS POSSIBLE ANTI-TUMOR AGENTS	PAL JAY
08581234	Not Issued	161	12/29/1995	SIMPLIFIED IGNITION AID FOR CDM LAMPS	PAL JAY
07729675	5281056	150	07/15/1991	INDEXING NOSE COUPLE	PAL JAY
07636718	Not Issued	168	01/02/1991	PROCESS FOR CONVERSION OF WASTE NICKEL-CADMIUM SLUDGE TO HIGH-PURITY SALTS	PAL JAY
07578597	Not Issued	161	09/04/1990	LOW COST, LOW TECHNOLOGY FERTILIZER FOR DEVELOPING AREAS AND METHOD OF MANUFACTURE	PAL JAY
07455728	5028845	250	12/21/1989	HIGH-PRESSURE SERIES ARC DISCHARGE LAMP CONSTRUCTION	PAL JAY
07420257	Not Issued	161	10/12/1989	PREPARATION OF EXTRACTANTS FOR THE RECOVERY OF METAL IONS FROM AQUEOUS SOLUTIONS	PAL JAY
07420256	Not Issued	161	10/12/1989	RECOVERY OF METAL IONS FROM AQUEOUS SOLUTIONS	PAL JAY
07264526	4915936	150	10/31/1988	DENTAL HYGIENE COMPOSITION FOR REDUCING PERIODONTAL DISEASE	PAL JAY
07189482	4849193	150	05/02/1988	PROCESS OF PREPARING HYDROXYLAPATITE	PAL JAY

06467891	4457781	150	02/18/1983	METHOD FOR SOLIDIFYING WASTE SLIME SUSPENSIONS	PAL JAY
06427377	4421731	150	09/29/1982	PROCESS FOR PURIFYING PHOSPHOGYPSUM	PAL JAY
06393232	4424196	150	06/29/1982	PHOSPHOHEMIHYDRATE PROCESS FOR PURIFICATION OF GYPSUM	PAL JAY
06332579	Not Issued	168	12/21/1981	CONVERSION OF FLUOROANHYDRITE TO PLASTER	PAL JAY
06330611	4402922	150	12/14/1981	PROCESS FOR RAPID CONVERSION OF FLUOROANHYDRITE TO GYPSUM	PAL JAY
06330550	4388292	150	12/14/1981	PROCESS FOR REDUCING RADIOACTIVE CONTAMINATION IN PHOSPHOGYPSUM	PAL JAY
06330529	4452770	150	12/14/1981	PHOSPHOANHYDRITE PROCESS	PAL JAY
06096581	4251416	150	11/21/1979	CARPET BACKING ADHESIVE	PAL JAY

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Inventor Name Search Result

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Last Name = STROWBRIDGE
First Name = LETITIA

Application#	Patent#	Status	Date Filed	Title	Inventor Name 1
10074111	Not Issued	030	02/11/2002	METHOD AND APPARATUS FOR SANITIZING REUSABLE ARTICLES	STROWBRIDGE, LETITIA

Inventor Search Completed: No Records to Display.

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Inventor Name Search Result

Your Search was:

Last Name = NOWACK
First Name = KEITH

Application#	Patent#	Status	Date Filed	Title	Inventor Name 1
10074111	Not Issued	030	02/11/2002	METHOD AND APPARATUS FOR SANITIZING REUSABLE ARTICLES	NOWACK, KEITH B.

Inventor Search Completed: No Records to Display.

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Inventor Name Search Result

Your Search was:

Last Name = RODRIGUEZ
First Name = JORGE

Application#	Patent#	Status	Date Filed	Title	Inventor Name 41
60412677	Not Issued	020	09/23/2002	ELECTRONIC PRESCRIPTION FULFILLMENT PROCESS (EPFP)	RODRIGUEZ, JORGE LUIS
60178017	Not Issued	159	01/24/2000	CAR ELECTRIC SAFETY SWITCH	RODRIGUEZ, JORGE EDUARDO
60169481	Not Issued	159	12/07/1999	CHILD SAFETY MIRROR	RODRIGUEZ , JORGE EDUARDO
29149007	D471565	150	10/02/2001	ENGAGEMENT ARRANGEMENT OF TWO CONNECTABLE BODIES	RODRIGUEZ, JORGE TORAL
29149006	D471212	150	10/02/2001	ENGAGEMENT ARRANGEMENT OF TWO CONNECTABLE BODIES	RODRIGUEZ, JORGE TORAL
10417468	Not Issued	030	04/16/2003	MULTILEVEL ANALYSIS OF SELF-SIMILAR NETWORK TRAFFIC	RODRIGUEZ, JORGE R.
10417467	Not Issued	030	04/16/2003	MMPP ANALYSIS OF NETWORK TRAFFIC USING A TRANSITION WINDOW	RODRIGUEZ, JORGE R.
10343570	Not Issued	030	05/19/2003	NOVEL COMPOSITION FOR TRANSDERMAL	RODRIGUEZ, JORGE

				AND/OR TRANSMUCOSAL ADMINISTRATION OF ACTIVE COMPOUNDS THAT ENSURES ADEQUATE THERAPEUTIC LEVELS	
10180629	6606237	150	06/27/2002	MULTILAYER CAPACITOR, WIRING BOARD, DECOUPLING CIRCUIT, AND HIGH FREQUENCY CIRCUIT INCORPORATING THE SAME	RODRIGUEZ, JORGE P.
10150172	Not Issued	030	05/17/2002	PREVENTING CACHE FLOODS FROM SEQUENTIAL STREAMS	RODRIGUEZ, JORGE ROLANDO
10074111	Not Issued	030	02/11/2002	METHOD AND APPARATUS FOR SANITIZING REUSABLE ARTICLES	RODRIGUEZ, JORGE L.
10008449	Not Issued	041	12/03/2001	VARIABLE SIZE PREFETCH CACHE	RODRIGUEZ, JORGE R.
10006280	6643735	150	12/03/2001	INTEGRATED RAID SYSTEM WITH THE CAPABILITY OF SELECTING BETWEEN SOFTWARE AND HARDWARE RAID	RODRIGUEZ, JORGE R.
10005426	Not Issued	092	11/07/2001	PARTITIONED CACHE OF MULTIPLE LOGICAL LEVELS WITH ADAPTIVE RECONFIGURATION BASED ON MULTIPLE CRITERIA	RODRIGUEZ, JORGE R.
09930852	6666676	150	08/15/2001	PROGRAMMABLE BURNER FOR GAS STOVES	RODRIGUEZ-RODRIGUEZ, JORGE
09838607	Not Issued	093	04/19/2001	DESIGNING A CACHE USING AN LRU-LFU ARRAY	RODRIGUEZ, JORGE R.

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09838433	Not Issued	093	04/19/2001	DESIGNING A CACHE WITH ADAPTIVE RECONFIGURATION	RODRIGUEZ, JORGE R.
09816665	6545346	150	03/23/2001	INTEGRATED CIRCUIT PACKAGE WITH A CAPACITOR	RODRIGUEZ, JORGE PEDRO
09751612	6532143	150	12/29/2000	MULTIPLE TIER ARRAY CAPACITOR	RODRIGUEZ, JORGE PEDRO
09747504	Not Issued	071	12/21/2000	SYSTEM AND METHOD FOR LOGGING MESSAGES IN AN EMBEDDED COMPUTER SYSTEM	RODRIGUEZ, JORGE E.
09747353	Not Issued	030	12/21/2000	SYSTEM AND METHOD FOR ADDING TRANSPORT PROTOCOLS IN DISTRIBUTED MIDDLEWARE APPLICATIONS	RODRIGUEZ, JORGE E.
09741302	6483692	150	12/19/2000	CAPACITOR WITH EXTENDED SURFACE LANDS AND METHOD OF FABRICATION THEREFOR	RODRIGUEZ, JORGE PEDRO
09607133	Not Issued	030	06/29/2000	METHOD AND SYSTEM FOR PREDICTING INTER-PACKET DELAYS	RODRIGUEZ, JORGE R.
09607013	6715005	150	06/29/2000	METHOD AND SYSTEM FOR REDUCING LATENCY IN MESSAGE PASSING SYSTEMS	RODRIGUEZ, JORGE R.
09606985	Not Issued	083	06/29/2000	METHOD AND SYSTEM FOR MODELING A COMPLEX SYSTEM	RODRIGUEZ, JORGE R.
09604446	6678782	150	06/27/2000	FLOW ARCHITECTURE FOR REMOTE HIGH-SPEED INTERFACE APPLICATION	RODRIGUEZ, JORGE ROLANDO
09577595	Not Issued	161	05/25/2000	CUSTOMIZABLE E-COMMERCE APPLICATION PLATFORM	RODRIGUEZ, JORGE R.

09577038	Not Issued	161	05/24/2000	CUSTOMIZABLE E-COMMERCE APPLICATION PLATFORM	RODRIGUEZ, JORGE R.
09141976	6126435	150	08/28/1998	ELECTRONIC IGNITION SYSTEM FOR A GAS STOVE	RODRIGUEZ-RODRIGUEZ , JORGE
08948597	Not Issued	161	10/10/1997	ELECTRONIC IGNITION SYSTEM FOR A GAS STOVE	RODRIGUEZ-RODRIGUEZ , JORGE
07902692	5246499	150	06/23/1992	APPARATUS FOR APPLYING SCRATCH-RESISTANT COATINGS TO PLASTIC OPHTHAL-MIC LENSES	RODRIGUEZ , JORGE M.
07703251	5164228	150	05/20/1991	METHOD OF APPLYING SCRATCH-RESISTANT COATINGS TO PLASTIC OPHTHALMIC LENSES	RODRIGUEZ , JORGE M.
07647037	5246728	150	01/29/1991	SCRATCH-RESISTANT COATING AND METHOD OF MAKING COATED LENSES	RODRIGUEZ , JORGE M.
07645597	Not Issued	161	01/25/1991	PROCESS AND APPARATUS FOR MEASURING THE ALCOHOL CONTENT OF DAMPING FLUID IN AN OFFSET PRINTING PRESS	RODRIGUEZ-GILES , JORGE M.
07479867	Not Issued	161	02/14/1990	MULTIDIMENSTIONAL DATA MANIPULATION	RODRIGUEZ , JORGE E.
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06059343	4303721	150	07/20/1979	CLOSED CELL FOAM PRINTING BLANKET	RODRIGUEZ , JORGE M.

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DOCUMENT-IDENTIFIER: US 20020122743 A1
TITLE: Ultraviolet sterilization apparatus and method

Abstract Paragraph:
A method and device for sterilizing an object in a dual-purpose household appliance such as microwave ovens, dishwashers, laundry machines, etc. The device includes a housing unit having a chamber for containing the object to be sterilized, an ultraviolet light source positioned outside the chamber and an exposure panel of a fixed, retractable, or flip open design, the exposure panel enabling the ultraviolet light source to emit ultraviolet radiation onto the object to be sterilized.

Summary of Invention Paragraph:
[0002] The present invention relates to a method and apparatus for sterilizing objects using ultraviolet radiation.

Summary of Invention Paragraph:
[0004] Due to the increase in awareness of the potentially harmful effects that microorganisms, such as fungi, bacteria and viruses can have on humans, there have been several attempts to provide devices that sterilize food, liquids and other items.

Summary of Invention Paragraph:
[0005] For example, (i) U.S. Pat. No. 5,886,329 to Kim generally discloses an antibiotic microwave oven that utilizes high frequency energy and an antibiotic surface to kill bacteria bread within the cooking chamber and prevent propagation of harmful microbes; (ii) U.S. Pat. No. 4,448,750 to Fuesting generally discloses a method for disinfecting or sterilizing small objects by placing them in an aqueous solution and exposing them to ultrasonic and ultraviolet radiation; (iii) A toothbrush conditioner, whereby toothbrushes are conditioned through exposure to ultraviolet radiation, is disclosed by U.S. Pat. No. 4,803,364 to Ritter; (iv) Contact lenses sterilized by exposure to variations of energy levels of a microwave field in a microwave oven are disclosed by U.S. Pat. No. 4,956,155 to Rohrer et al.; and (v) Food products sterilized by exposure to a radio frequency field are disclosed by U.S. Pat. No. 3,272,636 to Fehr et al. These and other attempts have previously been made to combat harmful microbes.

Summary of Invention Paragraph:
[0006] Among the various sterilization methods, ultraviolet radiation has proven to be effective in the harmful effects of unwanted microbes. When various microorganisms are exposed to ultraviolet radiation for a period of time, many of the microorganisms are killed and are therefore effectively

h e b b g e e e f c e f

neutralized.

Summary of Invention Paragraph:
[0007] Of the various systems and methods described in the above-cited references, many include multiple devices and/or complicated methods for sterilization. Moreover, if it is desired to sterilize, for example, contact lenses and a toothbrush, separate devices must be obtained for each item to be sterilized.

Summary of Invention Paragraph:
[0008] Boucher, in U.S. Pat. No. 3,926,556, which is incorporated herein by reference, discloses a method and apparatus for low temperature intermittent or continuous destruction of microorganisms for decontamination of organic fluids using the synergistic effects of combined ultraviolet radiation and microwave energy. Boucher's apparatus involves the use of an ultraviolet lamp inside a microwave chamber, wherein sterilization is obtained through the synergistic combination of non-thermal biocidal effects of microwaves and the biocidal effects of ultraviolet radiation. Boucher's device uses a microwave cavity having a series of parallel capillary glass tubes for liquid flow and ultraviolet lamps positioned next to the glass tubes. Boucher's device is very complicated and not suitably used in microwaves for home use, as the device does not allow use of a microwave cavity for cooking purposes, e.g., for temperatures over 100 degrees.

Summary of Invention Paragraph:
[0009] Le Vay discloses an invention in U.S. Pat. No. 5,166,528, which is also incorporated herein by reference, which basically converts Boucher's invention for application in microwave ovens for home use. Le Vay describes an ultraviolet sterilizer that includes a housing having ultraviolet lamps. A microwave field generated by the microwave oven activates the ultraviolet lamps. The device disclosed by Le Vay solves many of the previous problems with sterilizers, but requires a specially designed holder having multiple microwave-activated ultraviolet lamps. This device poses additional problems such as where to put the holder when not in use (i.e., during cooking); how to protect the ultraviolet lamps from being broken when the holder is being stored; and difficulties associated with cleaning the specially adapted holder. The devices disclosed by Boucher and Le Vay have limitations in that they cannot be used for sterilization of objects that are sensitive to microwaves (e.g., metals, fresh fruit or vegetables). While Boucher explicitly explains that biocidal effects are derived from non-thermal effects of microwaves, it is not disputed that the microwaves can generate a significant amount of heat in the objects to be sterilized.

Summary of Invention Paragraph:
[0010] Newman, in U.S. Pat. No. 6,165,526, which is incorporated herein by reference, discloses a microwave oven having ultraviolet lamps disposed in the oven chamber for decontamination of food. However, sterilization lamp is placed within the chamber, which decreases oven space, increases the difficulty of oven chamber cleaning, and increases the likelihood of potential damage to UV lamps by being impacted during cleaning and/or cooking and contamination by food particles.

Summary of Invention Paragraph:
[0011] Accordingly, it is an object of the present invention to solve one or

more of the foregoing problems. The invention includes an apparatus having (1) a housing unit including a chamber for containing an object to be sterilized, and (2) an ultraviolet light source disposed in the housing unit at a location outside of the chamber and operative to expose the object to be sterilized upon activation of a sterilization process.

Summary of Invention Paragraph:
[0012] In an exemplary implementation of the present invention, the housing unit is a microwave oven adapted to sterilize objects with an ultraviolet light source. The sterilization equipment is not present within the chamber during periods when the oven is used for cooking. When a sterilization process is activated, an ultraviolet light source is controlled to expose an object in the chamber to ultraviolet radiation for a predetermined period of time. Utilizing the present invention, special devices for sterilizing are not required, but rather are integrated with conventional features of a microwave oven. Additionally, chamber space is not reduced by sterilization equipment in the microwave oven.

Summary of Invention Paragraph:
[0013] In one embodiment of the invention, a window is provided between the sterilization chamber and the ultraviolet radiation source. The window may be reflective of microwaves on a chamber side and transparent to ultraviolet radiation on the source side.

Summary of Invention Paragraph:
[0014] In another embodiment of the invention, an openable window is provided to expose objects in the sterilization chamber during a sterilization process and closeable to protect the UV radiation source during non-sterilization periods.

Summary of Invention Paragraph:
[0015] In yet another embodiment of the invention, a pivoting door is provided in a wall of the sterilization chamber and when activated, the ultraviolet source moves through the pivoting door to enter the chamber and expose an object to be sterilized to UV radiation.

Summary of Invention Paragraph:
[0016] By providing a UV radiation source that is out-of-chamber during normal use of an appliance, a seamless transition is obtained between use of the device as traditional appliance and/or a sterilization device. Implementation of the invention in a microwave oven enables microwave-sensitive objects to be sterilized in an integrated package that is available for home use.

Summary of Invention Paragraph:
[0017] For materials that are not sensitive to microwaves, as disclosed by Boucher, a synergistic combination of microwave and ultraviolet radiations can be used to effectively sterilize an object when the ultraviolet sterilizer is implemented in a microwave oven. However, with the sterilizer of the present invention, effective sterilization can be achieved without the use of microwaves and the sterilizer according to the present invention does not consume any extra space in a microwave chamber. Implementation of the present invention in a microwave oven may be advantageous as a majority of microwave ovens include a rotating turntable that improves effectiveness of

exposure of an object being sterilized to the ultraviolet radiation source.

Summary of Invention Paragraph:
[0018] According to various aspects of the present invention, chamber space is reserved for objects to be microwaved or sterilized when the ultraviolet radiation source is located outside of the appliance chamber. Additionally, the risk of contamination of the UV lamp surface is reduced when, for example, food being prepared in a microwave oven, hence effectiveness of sterilization is assured. According to further aspects of the present invention, disposing UV lamps outside of a sterilization chamber during periods of non-sterilization reduces the risks of accidentally breaking UV lamps of a sterilizer.

Brief Description of Drawings Paragraph:
[0019] FIG. 1 is a perspective view of an ultraviolet sterilization device according to an exemplary embodiment of the present invention.

Brief Description of Drawings Paragraph:
[0020] FIG. 2 is a cross sectional view of a wall of a sterilization chamber having an ultraviolet radiation source according to one embodiment of the present invention.

Brief Description of Drawings Paragraph:
[0021] FIG. 3 is a cross sectional view of a sterilization chamber wall having an ultraviolet radiation source according to another embodiment of the present invention.

Brief Description of Drawings Paragraph:
[0022] FIG. 4 illustrates a cross-sectional view of a sterilization chamber wall having an ultraviolet radiation source in a modified implementation of the present invention.

Brief Description of Drawings Paragraph:
[0023] FIG. 5 illustrates a cross-sectional view of a sterilization apparatus during a non-sterilizing period according to another embodiment of the present invention.

Brief Description of Drawings Paragraph:
[0024] FIG. 6 is a cross-sectional view of the sterilization apparatus of FIG. 5 when a sterilization process is activated.

Brief Description of Drawings Paragraph:
[0025] FIG. 7 is a top view of the sterilization apparatus of FIG. 5.

Brief Description of Drawings Paragraph:
[0026] FIG. 8 is a schematic diagram of a sterilization apparatus control device according to one implementation of the present invention.

Brief Description of Drawings Paragraph:
[0027] FIG. 9 is a cross-sectional view of a sterilization apparatus according to another embodiment of the present invention.

Brief Description of Drawings Paragraph:
[0028] FIG. 10 is a side view of the sterilization apparatus of FIG. 9.

Detail Description Paragraph:
[0030] According to an exemplary embodiment of the present invention, an ultraviolet sterilizer is provided that kills microorganisms using ultraviolet radiation. An ultraviolet sterilizer according to the present invention uses at least one UV lamp to produce ultraviolet radiation for any predetermined period of time, which may be selected by the user, and/or preprogrammed into the device, thereby destroying harmful microbes present on objects subjected to the ultraviolet radiation.

Detail Description Paragraph:
[0031] The ultraviolet sterilizer 100 includes a housing unit 110 having a chamber 120 for sterilizing objects. An object to be sterilized is placed in chamber 120. In a preferred embodiment, chamber 120 is a chamber of a common household device (e.g., microwave, toaster-oven, dishwasher, range-top oven, refrigerator, or crock pot). In the preferred embodiment, sterilizer 100 is a modified microwave oven and sterilization chamber 120 is a food-cooking chamber of the microwave oven.

Detail Description Paragraph:
[0032] Once the object to be sterilized (hereinafter "object") is placed in chamber 120, the sterilization process is activated by control panel 140, that also serves as control panel for setting cooking power and times in microwave oven 100. Upon activation of the sterilization process, the object is irradiated by a UV lamp (shown in FIGS. 2-10) for a predetermined period of time. Irradiation of the object occurs through an exposure panel 130 located on an interior wall of chamber 120. There are several different implementations for exposure panel 130 as described in further detail below.

Detail Description Paragraph:
[0033] As shown in the ultraviolet sterilizer 100 of FIG. 1, one or more exposure panels 130 may be located on any one as well as on all sides of the chamber 120. For maximum elimination of microorganisms on objects to be sterilized, it is preferable that all surfaces of the object be subjected to direct exposure of ultraviolet radiation. Therefore, positioning exposure panels 130 on the top, bottom and sides of the ultraviolet sterilizer 100 may promote improved sterilization.

Detail Description Paragraph:
[0034] The ultraviolet sterilizer of FIG. 1 may be used to kill harmful microorganisms on any number of household items. Some potential objects to be sterilized in the home may include, but are not limited to, dishes, silverware, food items, contact lenses, cell phones, pacifiers, baby bottles, toys, razors, dish rags and washcloths, toothbrushes, false teeth, tools, containers, fruits, vegetables, etc.

Detail Description Paragraph:
[0035] Turning now to FIG. 2, an example embodiment of exposure panel 130 is shown. Ultraviolet radiation source 200 is positioned between a wall of the chamber 120 and a wall of housing unit 110. In FIGS. 2-3, ultraviolet radiation source 200 is of a flood lamp design and is mounted to the wall housing unit with reflector 210 via a conventional socket unit. Exposure panel 130 in FIG. 2 is a fixed-window configuration made of a material that is substantially transparent to ultraviolet radiation on the UV radiation

source 200 side of the chamber 120 (arrows represent example UV radiation penetration through panel 130). In the exemplary implementation of the invention using a microwave oven, the exposure panel material would preferably be reflective to microwave radiation on a chamber side of the panel 130. The fixed-window configuration of exposure panel 130 is preferable when implementing the sterilization device in water oriented appliances such as a dishwasher and/or laundry machine, since the exposure panel 130 would protect UV lamp 200 from exposure to water.

Detail Description Paragraph:
[0036] FIG. 3 illustrates an implementation of the invention that does not require exposure panel 130 to be transparent to ultraviolet radiation. Exposure panel 130 is configured to be open and closed during and after a sterilization process, respectively. Accordingly, exposure panel 130 may be made of an opaque material similar to that used in the chamber of a microwave oven; or in the case when sterilizer 100 is a conventional/toaster oven or refrigerator, a material may be selected that is temperature resistant and thus, protects ultraviolet source 200 when closed, e.g., during periods of non-sterilization. A mechanism (not shown) to open and close exposure panel 130 in the implementation of FIG. 3, can be any conventional means for electrically controlled mechanical systems such as a servo mechanism, a relay system, a pulley mechanism, etc. In this implementation of the present invention, the exposure panel 130 is opened during activation of a sterilization process, and closed during periods of nonsterilization. When operated in this manner, ultraviolet lamp 200 is protected from harmful effects generated by the device in which it is implemented (e.g., dishwasher, ovens, microwaves, laundry washer and dryers, etc.). It may also be advantageous for cleaning the sterilization chamber 120 when the exposure panels 130 of various embodiments of the present invention are substantially flush with an interior wall of the chamber 120.

Detail Description Paragraph:
[0037] Turning to FIG. 4, an embodiment of the present invention using a cylindrical UV lamp 401 is shown. Cylindrical UV lamp 401 is an example implementation of the present invention similar to FIGS. 2-3, using a different variety of radiation source. Both types of ultraviolet radiation sources 200, 401 may have the same effectiveness in sterilizing objects, but may be selected because of design considerations such as available space, availability of the lamps, associated costs, electrical connectivity, durability, etc. It should be recognized that while a fixed, UV transparent exposure panel 130 is shown in FIG. 4, the exposure panel may also be retractable similar to the implementation of the invention in FIGS. 3 and 9-10, or a flip open window implementation (FIG. 5).

Detail Description Paragraph:
[0038] Generally, there are two types of UV lamps available (in all shapes and sizes): (i) one with high ozone content that causes harmful side effects such as headaches, vomiting, etc. when human tissue is irradiated directly; and (ii) one with low ozone content and harmless to the health of humans. In the latter case, the intensity of the lamp is selected on recommendation of the World Health Organization (WHO) and the Environmental Protection Agency (EPA). In one implementation of the present invention, a low-ozone quartz UV lamp 401 is selected having electrodes activated similar to fluorescent lights.

Detail Description Paragraph:
[0039] An example UV lamp that has been used in the present invention is a 15 Watt, 220 volt, ZSZ Low Ozone Quartz UV Sterilization Lamp made by Tianjing No. 5 Lamp Company. However, it should be recognized that any commercially available UV lamp may work in the present invention, the selection of which is significantly dependent on design considerations such as, power consumption, amount of time desired for sterilization, the effectiveness of sterilization desired, type of microorganism to be neutralized, etc.

Detail Description Paragraph:
[0040] When a ten watt UV lamp is used, an average time for eliminating 99.9% of E.coli and other viruses and bacteria, in a space of .128m.sup.3 at exposure of 20,000 uW/cm.sup.2, is seven minutes. If the bulb wattage is changed to fifteen watts, sterilization will be obtained, with the same factors, in approximately four minutes.

Detail Description Paragraph:
[0041] The ultraviolet sterilizer discussed in the above implementations of the present invention utilizes a fixed UV lamp disposed in commonly used household appliances. However, it should be noted, that the inventor also contemplates that the ultraviolet sterilizer 100 can be implemented as a standalone device (e.g., without combination with other household appliances). Additionally, as shown by the FIG. 5 embodiment of the present invention and described below, the UV lamp is not required to be fixed.

Detail Description Paragraph:
[0042] FIGS. 5-7 shows another preferred embodiment of an ultraviolet sterilizer according to the present invention. As with all of the implementations of the present invention, the ultraviolet radiation source 401 is located outside the sterilization chamber 120. However, with the embodiment of FIG. 5, a radiation source mounting unit 500 enables UV lamp 401 to be inserted into chamber 120 through exposure panel 505 to perform sterilization. In this implementation, exposure panel 505 is a push-up or flip-open window configured to allow the UV lamp 401 to enter into the chamber 120. Exposure panel 505 is rotatably attached to a portion of the chamber 120 by a hinge 506 and a latching mechanism including magnets 510 and 511 to maintain a closed position during period of non-sterilization.

Detail Description Paragraph:
[0044] As shown in FIGS. 5-7, magnetic core 517 pivotally attaches to movable lamp arm 525 by a latch arm deadbolt 520. During activation of a sterilization process, electromagnet 518 is engaged causing movement of magnetic core 517 to a downward position, which in turn, rotates movable lamp arm 525 toward chamber 120 (see FIG. 6). A movable arm coupling 526 facilitates rotation of movable lamp arm 525.

Detail Description Paragraph:
[0045] An optional adaptation to radiation source mounting unit 500 is the inclusion of an alarm system that notifies a user when sterilization is complete. An alarm system according to one implementation of the invention shown in FIGS. 5-6 includes a bell 540, which is activated by a bell hammer 541 when movable lamp arm 525 returns to a non-sterilizing position (FIG. 6).

Detail Description Paragraph:
[0047] For implementation in an appliances such as a microwave ovens, dishwashers, laundry machines, etc., existing circuit controls, timers, power inputs, and alarm features are adapted for use with the sterilizer features. However, FIG. 8 is a schematic diagram for a circuit 800 to operate a sterilization apparatus according to the present invention.

Detail Description Paragraph:
[0048] Circuit board 810 houses a circuit for providing voltage to UV lamp 401 via magnetic leakage converter 550. Voltage is provided to circuit 800 through switch 820 that may, for example, be a safety door switch enabling sterilization only when a door is closed. Timer delay switch 830 allows the circuit to operate for a predetermined period of time specified by a timer input unit (not shown). When circuit 800 is operating, i.e., during a sterilization process, indicator 840 is illuminated to indicate sterilization is being performed. Where appropriate, circuit 800 is also adapted to provide power to the movable components (e.g., exposure panel 130, relay mechanism 515) during circuit operation.

Detail Description Paragraph:
[0049] FIGS. 9-10 illustrate another embodiment of the present invention. Here, UV lamp 401 is mounted in Lamp base 910, adjacent sterilization chamber 120. In this embodiment, exposure panel 130 is a retractable window-configuration (similar to embodiment of FIG. 3), and is retractable along an axis track 920 through reciprocal movement of electromagnet 930 and connection bar 935. Connection bar 935 pivotally attaches on one end, via coupling 936, to electromagnet 930, and pivotally attaches on an opposite end, via coupling 937, to exposure panel 130. In this manner, exposure panel 130 may be open and closed to allow radiation from UV lamp 401 to enter into sterilization chamber 120. Bell hammer 940 may optionally be provided on connection bar 935 in a position to strike alarm bell 950 when exposure panel 130 returns to a closed position, indicating an end of the sterilization process.

Detail Description Paragraph:
[0051] With a sterilization apparatus and method according to the present invention, a dual-function appliance (e.g., microwave oven/sterilizer) may be provided that has the same space inside the appliance chamber as a standard, single function appliance of the same style. Additionally, because the UV lamps are stored outside of the chamber, a lower incidence of UV lamp damage and/or contamination is obtained as well as simplified cleaning of the chamber.

CLAIMS:

1. An apparatus for sterilizing an object comprising: a housing unit including a chamber for containing the object; an ultraviolet light source for emitting ultraviolet radiation; and an ultraviolet light source mounting device operative to move the ultraviolet light source into the chamber to sterilize the object and withdraw the ultraviolet light source from chamber thereafter.

4. The apparatus of claim 2, wherein the housing unit is a household

appliance selected from the group consisting of dishwasher, laundry dryer, toaster oven, and range top oven.

5. A method for sterilizing an object comprising: (a) placing an object to be sterilized into a sterilization chamber; (b) moving an ultraviolet light source into the sterilization chamber in response to activation of a sterilization process; (c) emitting radiation from the ultraviolet light source; and (d) removing the ultraviolet light source from the sterilization chamber.

6. The method according to claim 5 wherein said sterilization chamber is a heating chamber of a microwave oven.

7. The method according to claim 5, wherein the object to be sterilized is selected from the group consisting of dishes, silverware, food items, contact lenses, cell phones, pacifiers, baby bottles, toys, razors, dish rags, washcloths toothbrushes, false teeth, tools, and containers.

8. An apparatus for sterilizing an object comprising: a housing unit including a chamber for containing the object; at least one ultraviolet light source for emitting ultraviolet radiation during a sterilization process, the at least one ultraviolet light source disposed inside said housing unit and outside said chamber; and at least one exposure panel disposed in a wall of said chamber proximate said at least one ultraviolet light source, the at least one exposure panel configured to allow the at least one ultraviolet light source to irradiate the object during the sterilization process.

10. The apparatus of claim 8, wherein the at least one exposure panel comprises a retractable panel operative to open during the sterilization process and close during a period of non-sterilization.

11. The apparatus of claim 8, wherein the at least one exposure panel comprises a flip panel configured to be opened during the sterilization process and closed during a period of non-sterilization to facilitate simplified cleaning of said chamber and protect the at least one ultraviolet light source.

13. The apparatus of claim 8, wherein the housing unit comprises a dual-function household appliance having a function in addition to sterilizing objects.

14. The apparatus of claim 13, wherein the dual-function household appliance is one selected from the group consisting of electric-element ovens, crockpots, dishwashers, laundry machines and refrigerators.

15. A microwave oven adapted for sterilization of an object using ultraviolet light, the microwave oven comprising: an oven chamber for sterilizing the object; a sterilization unit comprising at least one ultraviolet light source disposed outside the oven chamber during periods of non-sterilization to enable full utilization of said oven chamber for cooking; and at least one exposure panel disposed in an interior wall of said oven chamber, wherein the at least one exposure panel is configured to allow the sterilization unit to emit ultraviolet radiation onto the object in response to activation of a sterilization process.

16. The microwave oven adapted for sterilization according to claim 15, further comprising: a rotatable turntable disposed in said oven chamber for supporting the object, wherein the turntable is configured to rotate during the sterilization process.

17. The microwave oven adapted for sterilization according to claim 15, wherein the at least one exposure panel is a panel selected from the group consisting of fixed panel, retractable panel and flip panel design.

18. The microwave oven adapted for sterilization according to claim 17, further comprising, an alarm unit operative to notify a user when a sterilization process is completed.